Zoologic Companion Animal Rehabilitation and Physical Medicine

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KEYWORDS

- Exotics • Zoologic animals • Rehabilitation • Pain management
- Massage • Therapeutic laser

Similar to traditional pet species, zoologic companion animals are subject to illness and injury. Therefore it is important to recognize not only the merits of traditional analgesia for these species but also the benefits of physical medicine. Physical medicine is an all-encompassing term that refers to the use of mechanical touch and physical modalities including cryotherapy, heat therapy, laser therapy, massage, and rehabilitation. Physical medicine can be an integral part of recovery from trauma and surgery for veterinary patients and typically has fewer adverse effects than conventional medicine, yet it can aid in a more rapid and complete recovery. Zoologic companion animals sometimes struggle with conventional medical interventions and may recover more slowly than other species, making these patients natural candidates for rehabilitation.

PAIN EVALUATION AND ANALGESIA: AN ESSENTIAL FIRST STEP

Regardless of the species presented, the ability to assess pain in an individual patient is essential before beginning any form of physical medicine. A discussion of pain recognition and traditional pharmacologic analgesia in zoologic companion animals is beyond the scope of this article, but the reader is referred to previous work on this subject.[1] Ethical considerations and performance ability should be taken into account when working with patients with managed or poorly managed pain. Patients with pain cannot perform therapeutic exercise as effectively, and rehabilitation becomes

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The authors have nothing to disclose.

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Vet Clin Exot Anim 14 (2011) 131–140
doi:10.1016/j.cvex.2010.09.008

1094-9194/11/$ – see front matter © 2011 Published by Elsevier Inc.

unpleasant for the patient, client, and veterinarian if the exercises make the patient uncomfortable. Although rehabilitation and physical medicine can provide some analgesia, in cases in which severe pain is present these modalities need to be augmented by additional treatments including local pain control measures, pharmaceutical intervention, acupuncture, and related techniques. Appropriate analgesia for a wide variety of zoologic companion animals is discussed in other articles in this issue.

CRYOTHERAPY

Cryotherapy, the application of cold therapy to an injured area, is often used to reduce pain and inflammation during the acute phase of injury. Cold packs applied to an acute injury reduce pain by slowing nociceptor transmission from the area. Cryotherapy also reduces pain by causing vasoconstriction, which lessens local edema and inflammation, and slows the release of histamines and other inflammatory mediators at the site of injury by limiting blood flow and local cellular metabolism, further offsetting pain and uncomfortable postoperative swelling.[2] Cryotherapy provides effective analgesia at little cost, and owners can be taught to apply this therapy for their companion animal at home, as long as they receive appropriate information about the risks and safe application. Rabbits and ferrets recovering from surgery are excellent candidates for routine basic cryotherapy as shown in **Fig. 1**. Ice packs are rolled into a light towel and applied to the surgical incision at 10- to 15-minute intervals 3 to 4 times daily in the first 1 to 2 days after operation. Subjectively, the authors have observed a decrease in incisional complications, such as swelling and self-mutilation, since instituting this therapy.

Small exotic companion animals can chill easily, therefore, the body temperature needs to be monitored and accounted for when considering the use of cold therapy for an injury. For example, cryotherapy may be contraindicated in the immediate postoperative period or just after an injury because the patient may be hypothermic. It is also important to monitor patients carefully while applying ice packs to ensure that they are not having an adverse topical reaction and that their core body temperature remains stable. Cryotherapy may cause deleterious local or systemic effects in reptiles, amphibians, and fishes because the ectothermic physiology of these species precludes safe use. Chilling ectothermic animals reduces immune function, which is essential for recovery from injury and illness.[3–5]

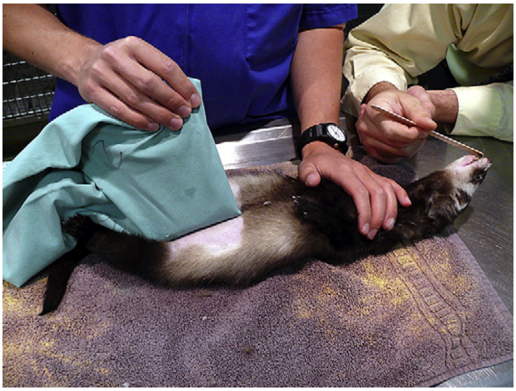

Fig. 1. A ferret with a postoperative abdominal incision receives cryotherapy while eating a treat.

THERAPEUTIC LASER

Therapeutic laser is recommended for wound healing and analgesia, and this technique continues to gain application in veterinary medicine, including for zoologic companion species (**Fig. 2**). This technique has few risks and contraindications and is often beneficial. Although the complete mechanism of action of therapeutic laser is not well understood, when applied to an injured region it seems to improve circulation,[6] encourage normalized neurologic function,[7,8] affect local and regional inflammation,[6,9,10] and ease pain in the injured area.[11,12] It has also been shown that therapeutic laser can improve collagen deposition[13] and collagen density in injury healing, which improves superficial wound healing, hastens bone healing, and speeds the recovery period after an orthopedic injury.[14] Patients with a reduced bone density caused by nutritional secondary hyperparathyroidism or other causes recover faster when treatment is supplemented with laser therapy. Although this condition is common to certain companion reptiles, these models have not been studied specifically.[15] Published studies of laser therapy for zoologic companion animals are few, although one case report involving laser therapy as part of a multimodal approach to neuropathic pain management in a prairie falcon demonstrates that laser therapy may assist in pain reduction and wound healing.[16]

Therapeutic laser can be safely applied to most species, although the safety and penetration of laser through the thick epidermis of reptiles and fishes is unknown. In all species, laser is contraindicated during pregnancy and in juvenile animals with

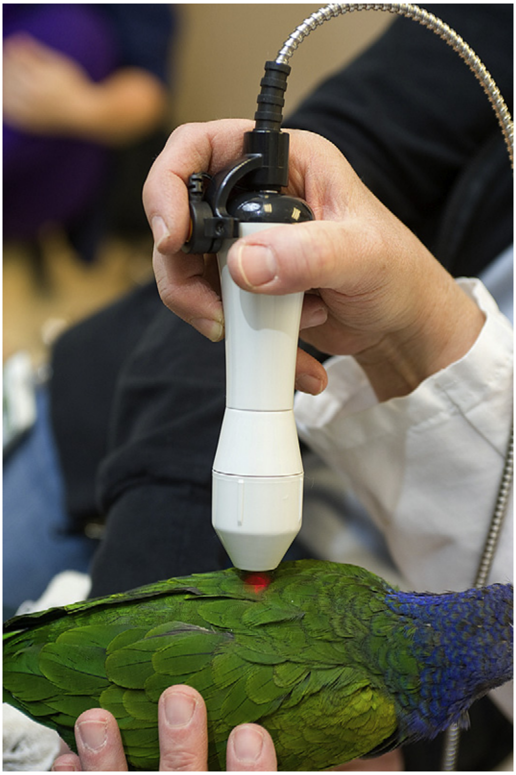

Fig. 2. Therapeutic laser is beneficial for a wide variety of conditions, including wound healing, pain management, and orthopedic and neurologic injuries.

open growth plates because its heating effect could prematurely close growth plates or have other adverse effects. Laser therapy should be avoided in patients with cancer, particularly at the tumor site, because it could potentiate cell growth. Laser should also be used with caution in small patients because it can quickly accumulate superficial heat, which may be painful or cause a burn. Patients' eyes should always be protected from direct laser light to avoid retinal damage. The optimal dose of laser has not yet been determined, although 1 to 5 J/cm^2 provides an effective treatment in most cases. Laser doses up to 60 J/cm^2 have been reported to be beneficial.[8,10,11]

THERAPEUTIC EXERCISE

Therapeutic exercise encompasses a wide variety of activities, which can be creative and enjoyable for patients and pet owners. A few key principles should be kept in mind when prescribing therapeutic exercise for zoologic companion animals. The most important aspect of therapeutic exercise is to avoid pain or further injury, and the recommended exercises should be natural and enjoyable for the patient to perform. If therapeutic exercise becomes a struggle for the patient, it is unreasonable to continue forcing the patient to perform these tasks. The goals for therapeutic exercise include strengthening, improving or maintaining range of motion of the joints and spine, and building proprioception and stability.[17]

Beginning with basic movement and assisted standing after an orthopedic or a neurologic injury is important. Assisting patients first into sternal recumbency and then to standing helps them build strength and balance to stand on their own, which leads to greater independence, the ability to eat and drink on their own, improved circulation, better lung function,[18–20] and a more effective transition to advanced therapeutic exercise. Good footing is important in the early stages of rehabilitation while the patient's balance and strength are being restored. Helping patients to relearn standing can be difficult if they are skittish, so devices such as slings or harnesses may be used. In addition, supportive devices such as carts can be made. There are companies that design carts for rabbits and other small mammals.

Performing passive range of motion exercises is an effective means of keeping joints moving appropriately as a patient recovers from injury, but it is essential that these exercises are done with extreme caution, particularly in small fragile patients that are susceptible to subsequent injury even with gentle handling. If owners will be performing passive range of motion exercises at home, they should be educated to look for signs of pain or discomfort. These exercises should be used to maintain current range of motion, not to push or stretch so hard that a soft tissue tear or fracture could occur. Passive range of motion exercise is considered an essential postoperative therapy after an orthopedic repair of most wing injuries; without exercise the propatagial tendon can become irreversibly contracted.[21–23]

As patients regain strength and coordination they can progress to more active therapeutic exercise, improvised according to the patient's species, specific goals, and abilities. Avian examples include weight shifting on a balance board, perching on a perch that is slightly movable, walking up and down an incline, and walking on an uneven or unsteady surface. Specific exercises can also be designed to strengthen specific muscle groups, such as lifting a small weight, step-up exercises, or maneuvering around an obstacle.

HEAT THERAPY

Warming an injured area is not appropriate in the acute inflammatory phase, but patients with chronic pain or old injuries may find superficial heat from a hot pack soothing and enjoyable. Superficial heat therapy reduces pain by reducing sympathetic neurologic tone, promoting circulation, and reducing muscle spasms. Heat therapy applied across the abdominal wall can also improve gastrointestinal motility,[24] likely because of the reduction in sympathetic tone and reduced pain sensation. Finally, heat therapy can speed healing because of its ability to increase tissue oxygenation, improve local circulation, and speed biochemical reactions. However, such therapy can also cause increased tissue destruction in the cases in which abundant degradative enzymes are present.[2]

Hot packs should be applied with caution and are contraindicated in patients with fever, acute inflammatory pain or difficulty with thermoregulation. If a patient reacts negatively to heat therapy, the treatment should be discontinued because the patient may experience increased pain as a result of heat. Extreme caution should be exercised when using hot pack therapy in sedated and anesthetized patients or those with decreased sensation caused by their disease process. Many zoologic companion species have delicate skin that burns more easily than that of cats and dogs, so in these species it is best to use hot packs only if the patient has normal sensation and an ability to move away from the heat source.

Therapeutic ultrasound is another modality used for heat application, but in this case the heat penetrates more deeply and is sometimes better tolerated than heat packs.[25] Therapeutic ultrasound can be used for heating muscles with contracture, particularly problematic in avian species after orthopedic wing repairs or prolonged wing bandaging. Treatment with therapeutic ultrasound can reduce contracture and improve range of motion in the affected joints when applied several times weekly[26] during bandage changes, before passive range of motion exercise or therapeutic exercise, and after a cast or bandage is removed in the final stages of healing and rehabilitation.

MASSAGE THERAPY

Massage therapy can be beneficial in many species for pain relief, anxiety reduction, and promotion of the human-animal bond. For these reasons, massage that is appropriately done can be rewarding for pet owners and pleasant for patients (**Fig. 3**). Gentle massage can help reduce edema, improve pain, and reduce sympathetic tone.

Gentle massage attuned to the patient's needs and tolerance can be applied by nursing staff and pet owners with proper training. Massaging the abdominal wall has been shown to improve postoperative ileus in humans,[27] and by extrapolation

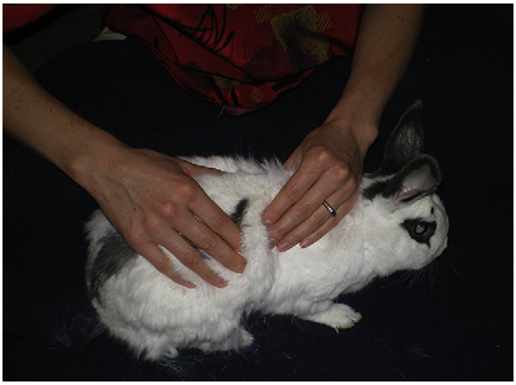

Fig. 3. A geriatric rabbit receiving massage therapy to reduce discomfort associated with widespread osteoarthritis.

and based on the authors' experience, is beneficial in small companion mammals such as rabbits, chinchillas, and guinea pigs. Putative mechanisms of massage performed with moderate pressure involve stimulation of vagal afferent fibers in the viscera as well as the abdominal wall.[28] Heightened vagal activity increases and/or regulates gastric motility as demonstrated in preterm human infants.[29,30]

Massage therapy for musculoskeletal ailments in humans improves range of motion,[31] dissipates myofascial restriction, treats pain, reduces anxiety, and elevates mood.[32,33] Given these positive effects and the safety of conscientiously performed massage, soft tissue manual therapy techniques such as massage play a prominent role in caring for rabbits and other small mammals experiencing myofascial and mechanical dysfunctions associated with head tilt.

SPECIFIC INJURIES

Orthopedic Injuries

Small mammals, birds, and reptiles are prone to orthopedic injuries, particularly fractures, because of their small size and thin cortices. Fractures and orthopedic injuries of all kinds are universally painful for animals and can be life threatening because of shock, pain, and secondary dysfunction, such as ileus. To minimize pain and secondary illness, rehabilitation modalities should be used to help get the patient back to a normal lifestyle as quickly as possible. In addition, appropriate rehabilitation exercise encourages pet owners to work with their pet daily, improving function and allowing early recognition of a complication, if it arises.

Fracture repair with external coaptation is not optimal because it leads to the degeneration of soft tissue in the affected limb and does not allow access to the site of injury for assessment and rehabilitation modalities. In cases in which external coaptation is the only option for fracture fixation, clients and veterinarians should be aware that degeneration will occur. Limb immobilization leads to loss of articular cartilage strength and density,[34,35] decreased tendon and ligament strength,[34,36] and degenerative joint changes similar to those seen in osteoarthritis. Casting a limb in flexion seems to have fewer deleterious effects on the joints and surroundings structures[34] but means less weight bearing and likely leads to a greater loss of bone density and muscle atrophy.

After the correction of a limb fracture, rehabilitation should initially focus on reducing pain and keeping the patient comfortable and mobile. Initial modalities should include cryotherapy, therapeutic laser, gentle massage, passive range of motion, and gentle weight-bearing exercises. If weight bearing is not attainable in the first several days, pain management should be adjusted to make the patient more comfortable. Cryotherapy can be given immediately after injury or surgery, assuming the patient has and is able to maintain a normal body temperature. Within 24 hours of the injury the affected limb can be taken through gentle passive range of motion, taking great care not to further injure the patient or cause discomfort. Within 12 to 24 hours, the patient should be assisted into a normal standing position to encourage weight bearing, even if it is minimal, on its affected limb. The patient should be encouraged to eat at this time, which helps it to learn that it is able to function on its own.

As the patient progresses through recovery, the prescription for therapeutic exercise can be updated regularly taking care not to push the patient too quickly and always ensuring that those working with the patient understand that if some treatment modality causes significant discomfort it should not be continued. With progress, patients can begin to perform exercises that emphasize active range of motion, in which they are encouraged to flex and extend their joints actively. Examples of exercises that accentuate range of motion are stepping over an obstacle or reaching out for a treat. Focus should also be placed on strengthening of the affected limb and improving proprioception to prevent further injury at this stage of recovery.

Avian patients should be gradually reintroduced to their normal perching habits as a component of their therapeutic exercise. Perches should initially be low and made over a padded landing, such as towels or pillows. Once the bird is able to demonstrate safe mounting and dismounting, an injury becomes less likely.

Patients that have their injured part placed in a cast or immobilized need to participate in controlled activity and therapeutic exercise until they regain normal function and strength. These patients are at a higher risk of injury because of atrophy and contracture,[34] so they are at a much higher risk for reinjury initially.

Neurologic Injuries

In the case of neurologic injuries, there are a variety of presentations stemming from a variety of underlying causes. Spinal trauma, peripheral nerve damage, neuropathic pain related to a prior injury, toxic insult, or infectious diseases can incite neurologic signs in zoologic companion animals. It is important to identify and treat the underlying cause of the disease because managing pain and performing rehabilitation are not as helpful in the face of a progressive disease such as infection, neoplasia, or continued toxin exposure.

Neurologic recovery assisted by rehabilitation can be rewarding but requires patience from the pet owner and veterinarian. Nerve tissue heals slowly, and recovery depends on the cause and severity of the inciting problem. Zoologic companion animals are often affected by trauma, but the basic principles described in this article apply to neurologic deficits resulting from many disease processes. Neurologic injuries can induce neuropathic pain, which can be life threatening and must be dealt with quickly and aggressively to prevent self-trauma[15] and other pain-related maladies.

As with orthopedic injuries, it is essential to ensure that pain is being managed well immediately after the injury with pharmaceutical interventions, acupuncture, and rehabilitation modalities targeted to reduce pain. Such management is the best way to reduce the risk of developing neuropathic pain in later stages of recovery. Rehabilitation modalities used at this stage are similar to those used immediately after an orthopedic injury and include cryotherapy, therapeutic laser, passive range of motion exercise, and gentle massage, if possible. Another essential component of rehabilitation in the early stages of neurologic injury is simulated or assisted weight bearing on the affected limbs. Performing an assisted stand, whether in a bird, small mammal, or reptile, should be done frequently after injury to limit neurogenic muscle loss and retrain the nervous system for standing. The patient must be helped into a normal anatomic standing position, and support should be decreased to make the patient bear as much of its own weight as possible. Eventually the animal weakens and is no longer able to support itself, but the process encourages rebuilding muscle and reestablishing muscle memory. This exercise can seem frustrating in the early stages and it can be tempting to give up, but perseverance often yields good results. As the patient progresses, it can be encouraged to walk with assistance, using manual support or a sling made from a towel or piece of bed linen.

An additional consideration for patients with neurologic injuries is the possibility of self-inflicted trauma because of absent sensation, abnormal sensation, or neuropathic pain. Self-trauma can be problematic in small mammals and birds, so vigilant monitoring is especially important in these species. Pet owners should be instructed to inspect their injured pet daily for scrapes, cuts, or other injuries that may require medical attention. If patients are unable to turn or right themselves, it is important to provide a comfortable supportive bed and turn them regularly to avoid discomfort and pressure sores.

Head Trauma and Head Tilt

Head tilt is a common problem in many species for a variety of reasons. Birds may develop a head tilt secondary to head trauma, whereas it is a common condition in rabbits and chinchillas with otitis media or otitis interna.[37] A head tilt can be uncomfortable and debilitating for patients of all species. Rehabilitating a patient with a head tilt greatly improves the quality of life by improving functionality and reducing discomfort associated with a head tilt.

Patients with a head tilt have severe discomfort in their cervical and cranial thoracic paraspinal muscles as a result of the abnormal head position. These muscle groups should be a major target for therapeutic laser and massage because loosening them and making them more comfortable allows patients to begin changing their head position as they gain the neurologic ability. Gentle cervical passive range of motion and subtle traction is also indicated if cervical trauma and instability have been ruled out. Bringing patients through this gentle range of motion allows cervical vertebrae to articulate normally, preventing muscle contracture and maintaining a normal range of motion while the patient is recovering. Traction provides axial elongation of the spine, which further supports a normal range of motion, but can cause spinal cord or vascular damage if excessive force is applied.[38] For the patient with a chronic head tilt, application of an appropriately heated warm pack can aid in range of motion activities and make massage more comfortable.

Assisted standing progressing to assisted walking is important for these patients because their head tilt may be so severe that they cannot stand or perch normally, which may alter their ability to eat, drink, and sleep, so it is important to take these factors into consideration. As with other neurologic injuries, patients should be assisted into a normal anatomic stance and supported only as much as they require. These patients often need abundant support initially, but as they improve they are able to do more and more on their own.

SUMMARY

It is vital to assess the underlying cause for injury or illness in zoologic companion animals, just as it is in other species. Once the underlying condition has been identified and appropriate treatment is instituted, the recovery process begins. Pain management is an essential component of physical rehabilitation because it leads to better patient compliance, more rapid recovery, and more ethical veterinary practice. Rehabilitation techniques are designed for improving recovery from injury or trauma and can also be used to improve quality of life in patients with ongoing or progressive medical conditions. Rehabilitation provides patients, pet owners, and veterinarians a gentle positive experience that leaves the patient less painful and more functional.

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